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General Comments:

1) Appendix G, Groundwater Flow Model

On page 747 of the Phase 3 RAP (Appendix G, Page 2-1), the following statement is made:

"The barrier wall does, however, reduce the estimated groundwater flux through the contained overburden by approximately 50 percent. This is due to the more circuitous route groundwater from the overburden units must take to discharge to the river, as well as the reduced gradients and tidal fluctuations caused by the barrier wall."

More detail needs to be provided relative to the modeled boundary conditions employed to represent Remedial Scenario 1. Based on the description in Appendix G, Section 2.1, this model scenario should represent zero water input from the surface, nearly zero water input laterally via Model Layers 1 and 2 (overburden), and primary water input through the Model Layer 3 (bedrock) within the lateral boundary of the modeled hydraulic barrier in overburden. As stated in the description of the model output for this scenario, the bedrock layer controls one-half (50%) of the volumetric water exchange between the enclosed portion of the model domain and the Acushnet River. This value for bedrock water exchange with the Acushnet River appears unreasonably high given the summary of site characterization data depicting the measured distribution of fractures in bedrock, as shown in Appendix B, Figure 1. Please also provide a graphical presentation of the modeled particle tracks through bedrock to the Acushnet River for the elevation domain represented in Figure 1 of Appendix B.

This is a critical issue for the remedy selection process, since the modeled degree of water exchange between bedrock underlying the site property and the portion of the Acushnet River abutting the property dominates the rating scores for the various remedial technologies. Thus, the accuracy of this modeled site characteristic needs to be understood with a high level of confidence. [Note: Need to review content of Appendix G, Phase II CSA to determine estimated spatial distribution of fractured bedrock.]

2) Section 4.1

Initial screening of remedial technologies did not include deep soil mixing as an alternative for installation of hydraulic containment barriers and/or introduction of treatment agents for destruction of contaminant mass. In combination with horizontal (surface) and vertical engineered barriers for controlling flow in the overburden aquifer, deep soil mixing provides a reasonable alternative to achieve contaminant mass reduction.

3) Section 5.3

Assessments of effectiveness, reliability, and long term costs appear to be inaccurate for the permeable reactive barrier component of the OU3-9 alternative relative to characteristics of the hydrologic system in which the PRB will be installed. A primary concern for PRB performance and long term maintenance

Loss of PRB porosity due to ZVI plugging on both sides

cost is the loss of permeability that will occur as a result of ZVI corrosion. For ZVI PRB installations in groundwater systems with a primarily univariate flow direction, porosity loss occurs at the upgradient portion of the barrier wall, which results in armoring or plugging at the initial plane of plume interception. For the proposed installation along the eastern edge of the site property, loss of porosity of the PRB will occur on both the upgradient and downgradient sides of the barrier wall due to the tidally-influenced change in flow directions. Tidal water exchange is anticipated to accelerate loss of PRB porosity and transmissivity and require active long-term maintenance to maintain or recover the ability of the PRB to treat the contaminant plume. Thus, the assignment of ratings for the OU3-9 alternative needs to account for this performance uncertainty.

Specific Comments:

4) Page 39, Section 2.5.2:

"A peat layer of varying thickness is present across much of the eastern portions of the Site. The sheet pile wall that defines the eastern edge of the Property was keyed into this peat layer to impede the migration of contaminants within shallow groundwater and from shallow soils into the river. However, contaminants in deep overburden groundwater and at the overburden bedrock interface migrate with tidal flow both toward and away from the river."

As demonstrated by prior data collection efforts by the Responsible Party, there is direct evidence from soil borings (MIP45, MIP46, MIP47) immediately west of the existing sheet pile wall that demonstrate the peat layer is not a continuous subsurface feature. While the prior intent may have been to key the sheet pile wall into the subsurface peat layer, more recent site characterization data demonstrate that this design objective was not and could not be achieved in the northeast portion of the site property. Please revise this statement and any other references throughout the document that directly state or imply that the sheet pile wall is fully keyed into a subsurface peat layer.

Sheet-pile not down to peat esp. in NE

Review Notes – not for inclusion in final version


Page 39, Section 2.5.2:

"A peat layer of varying thickness is present across much of the eastern portions of the Site. The sheet pile wall that defines the eastern edge of the Property was keyed into this peat layer to impede the migration of contaminants within shallow groundwater and from shallow soils into the river. However, contaminants in deep overburden groundwater and at the overburden bedrock interface migrate with tidal flow both toward and away from the river."

See prior review comment.

Page 39, Section 2.5.2:

"Groundwater flow in deep overburden and in bedrock is strongly influenced by the tides, reversing flow direction in response to the tidal cycle. The change in flow direction is exhibited most strongly at the shoreline in the deep overburden and bedrock aquifers. Due to the presence of the sheet pile wall, the shallow overburden aquifer on the Property has a limited tidal response."

 Support for control of tidal influence via installation of a hydraulic barrier.

Page 47, Section 4.1.1.1

"When combined with other remedy options, some of the in situ treatment techniques have been retained in OU3 although reduction of COC concentrations required for a Permanent Solution will be very challenging, largely due to the difficulties associated with Site conditions. The potential presence of residual DNAPL in some locations, proximity to the river, heterogeneous subsurface conditions (including debris laden urban fill materials and organic rich peat layers) and variable, tide influenced groundwater elevations create limitations for these technologies. In addition, three of the technologies are not effective for PCBs. Finally, thermal treatment requires a higher temperature for PCBs and has the added disadvantage of high energy use."

Page 48, Section 4.1.1.1.3

"However, solidification/stabilization process may be useful in conjunction with other excavation based alternatives for the management of wet or sloppy soils and the reduction of potential leachability."

Page 39, Section 4.1.1.3

"Containment consists of placement of a physical barrier that prevents direct contact with impacted soil and source material, through use of a cap, vertical barrier, or both. The advantages of a containment remedy are that handling and excavation of contaminated soil is not required, and there is a low degree of difficulty to implement. An AUL is required for use of a cap or engineered barrier containment, and long-term maintenance would be required. Containment technologies are readily available and reasonably likely to achieve a Permanent Solution for the Site. Containment has been retained for OU1 and OU3."

Page 49, Section 4.1.1.5:

"Excavation and on-site consolidation includes excavation of impacted soils from the Aerovox and Titleist properties, consolidation of the soils on the Aerovox property, and placement of an engineered barrier (for soils with COCs greater than UCLs) or cap over the consolidated soils."

No information on use of a bottom liner to prevent water infiltration/exfiltration during periods of potential inundation from storm surge or large precipitation events. This should be considered as part of final design.

Page 50, Section 4.1.1.6

"The City of New Bedford has already agreed to an AUL for the Aerovox property, if necessary for a condition of No Significant Risk and a Permanent Solution for the Site."

Initial screening of remedial technologies did not include deep soil mixing as an alternative for installation of hydraulic containment barriers and/or introduction of treatment agents for destruction of contaminant mass. In combination with horizontal (surface) and vertical engineered barriers for controlling flow in the overburden aquifer, deep soil mixing provides a reasonable alternative to achieve contaminant mass reduction.

As witnessed during IRA activities (Section 4.2.3, page 60), future removal and construction activities near the eastern shoreline present a likely risk for new contaminant releases from the Aerovox property to the Acushnet River. It is presumed that these new contaminant releases would pose a legal liability for the Aerovox property owner, since the post-date the time of the negotiated settlement for the Harbor. As such, all proposed remedial alternatives for OU3 should incorporate a design component(s) that prevent future surface and subsurface contaminant releases during the remedial construction phase.

Page 60, Section 4.2.3

"Based on groundwater monitoring activities presented in the Phase II Comprehensive Site Assessment dated September 18, 2015 and recent experience with the IRA Implementation, groundwater will be encountered in excavations deeper than approximately 3- 4 feet bgs associated with alternatives OU3-1 through OU3-9, depending on the tide cycle. Additionally, intermittent sheens were observed on the surface of the river during implementation of the IRA. A plan to minimize and/or control migration of sheens would be prepared as part of construction of any alternative that includes removal of soils adjacent to the river. For cost estimating purposes, groundwater control is assumed to be accomplished by a combination of perimeter dewatering well points and interlocking steel sheet piling. The water associated with the dewatering activities would likely be pretreated on-site and discharged to the New Bedford POTW."

Desired aspects for consideration of the final remedy design to achieve closure:

- 1) minimize residual contaminant mass in soils and groundwater
- 2) minimize potential future migration of contaminant mass not removed during final remedy
- 3) minimize surface exposure to contaminated media during construction of final remedy
- 4) minimize future operation and maintenance costs for final remedy

Page 62, Section 4.2.3.1

is this existing sheets or new ones?

"Hydraulic containment would be accomplished by the pumping of groundwater from five overburden extraction wells as shown in Figure 4.3.3-1. Based on the model results, to provide containment and prevent downward migration into bedrock, pumping would be needed at a combined rate of approximately 65 gallons per minute (gpm). The groundwater would be pumped from the five extraction wells to an on-site building for above ground treatment."

More detail needs to be provided relative to the modeled boundary conditions employed to represent Remedial Scenario 1. Based on the description in Appendix G, Section 2.1, this model scenario should represent zero water input from the surface, nearly zero water input laterally via Model Layers 1 and 2, and primary water input through the Model Layer 3 (bedrock) within the lateral boundary of the modeled hydraulic barrier in overburden. As stated in the description of the model output for this scenario, the bedrock layer controls 50% of the volumetric water exchange between the enclosed portion of the model domain and the Acushnet River. This value for bedrock water exchange with the Acushnet River appears unreasonably high given the summary of site characterization data describing the measured distribution of hydraulic conductivity of the bedrock.

Phase 3 RAP Page 747, Appendix G (Page 2-1):

"In addition, the barrier wall does not prevent the discharge of impacted groundwater from the overburden units to the Acushnet River. Particle flow tracking indicates that vertical communication between the overburden layers and the underlying bedrock will allow water to flow vertically downward into the bedrock, bypassing underneath the Barrier Wall, before discharging to the river. The barrier wall does, however, reduce the estimated groundwater flux through the contained overburden by approximately 50 percent. This is due to the more circuitous route groundwater from the overburden units must take to discharge to the river, as well as the reduced gradients and tidal fluctuations caused by the barrier wall."

While groundwater extraction may be necessary during remedial construction, it is not clear that this component of hydraulic containment will be required as a component of the final remedy. The groundwater model should be used to model two scenarios: 1) required pumping rate needed to maintain dewatering during subsurface remedial construction activities with a vertical hydraulic containment barrier installed to bedrock for the lateral extent depicted in Figure 4.3.3-1, and 2) future water level fluctuations for a scenario in which both surface recharge and lateral groundwater flow (from upland and river) is restricted through surface and vertical engineered containment barriers. For the second scenario, simulation of a hydraulic barrier through the vertical extent of both Model Layers 1 and 2 for the lateral extent of a vertical hydraulic barrier depicted in Figure 4.3.3-1. In addition, this modeling scenario should include assignment of a reduced value for surface recharge consistent with the emplacement of an engineered surface barrier over all or fractions of the area encompassed by the lateral extent of a vertical hydraulic barrier depicted in Figure 4.3.3-1. These scenarios represent a minor modification of Remedial Scenario 1, as represented in Appendix G. These two modeling scenarios need to be evaluated in order to fully evaluate construction costs and performance characteristics for a system in which full vertical and surface containment is implemented for the overburden aquifer.